SCIENCE

FRIDAY, JUNE 15, 1888.

THE LAST REPORT of the statistician of the Agricultural Department presents some interesting data for the students of economics in that portion of it which deals with farm-labor and its wages. Curiously enough, the result of the May, 1888, investigation of wages of farm-labor is almost identical with that of three years ago. The changes are very slight, though local differences occur, the averages of the geographical sections or groups of States being changed very little. The average rate per month, where the laborer boards himself, is a few cents lower in the Middle and Western States and in California, and a very little higher in the South and in New England. The highest rates obtained in 1866 in the Northern and Western States. In California and in the South there was a positive advance between that date and 1869. The investigation of 1875, a year or two after the monetary crisis appeared, showed decline in each section, which continued for several years, culminating in 1879, the date of lowest prices of all American farm-products. The decline from 1866 to 1879 amounted to 39 per cent in the Eastern States, 35 in the Middle, 30 in the Western States, and 17 in the Southern States. In California the rate of averages was well sustained, rising at first, but standing in 1879 higher than in 1866.

By a carefully constructed diagram Mr. Dodge shows the course of prices for more than twenty years, and the diagram is a forcible picture of the fearful depression caused by the six years of panic, from which a slow recovery began in 1879. The sharp decline from 1886, except in California, where the highest point after the war is noted in 1869, is a fall from an era of inflation, in which speculative values were all the higher from being stated in a depreciated currency. The present values appear to be on a more natural and stable basis. The rise was coincident with the return to specie payments, and the natural level was reached by a bound as soon as the pressure which depressed was removed. It is curious to note, further, that, at the lowest ebb of wages, rates were higher in the West than in the Middle States, and slightly above the lowest point reached in the Eastern States, because the soil was still cultivated, and crops were grown in their usual quantity, while much of the manufacturing industry was suspended. This Western line of wages would not have dipped so low but for the immigration to the West of Eastern operatives and artisans out of work, seeking employment and future homes.

There is a sufficiency of farm-labor in this country, as a whole, with a comparatively even balance between the geographical divisions. There are localities in perhaps every State where scarcity exists, and others having a superabundance. There is in some places a scarcity of agricultural labor caused by demand at higher wages for labor in some specific local industry. There is reported now, as always heretofore, a tendency to exercise distinctive preferences, and encourage peculiar aptitudes, for professions and avocations outside of agriculture, generally leading away from the country to the town or city. A temporary disturbance of the relation between demand and supply is found in some localities as a result of a somewhat rapid change in the character of the rural industries pursued. Where general farming has been partly replaced by an extension of pastoral industry, the effect has been to reduce the demand for labor; but in other cases there is a notable increase in gardening and fruit-growing, which occasion a large increase in the labor required for the cultivation of a given area. The continued development of truck-farming, near many of the navigable waters and some of the railroad-lines of the South, affords a conspicuous example of the latter class of changes.

A considerable number of reports from the more Atlantic coast States, and from some farther West, mention the migration of laborers as a cause of a noticeable reduction in the supply of labor. Usually the movement is simply a part of the general westward drift of population, but there are some movements of a more limited and special character. In Mississippi, for example, the reports from certain counties mention the departure of many colored laborers to the richer lands of the Mississippi bottoms or of the Yazoo delta, and a similar movement from a thin upland soil to river-bottom lands is also mentioned by some correspondents in Louisiana and Arkansas. Some reports from Virginia and North Carolina mention the departure of many colored people for the North. Others from the same and other States refer to a movement southward. Some Alabama reports mention a movement of colored laborers to settle on public land in that State as homesteaders. One North Carolina report, that from Cabarrus County, states that forty colored men had left for California, but the labor-supply in the neighborhood from which they had gone was still sufficient. In some localities, however, a considerable deficiency is reported as a result of such migrations.

THE CONTEST in the New York City Board of Education has resulted in the re-election of Mr. Jasper as superintendent by a vote of twelve to nine; and the political ring whose servant he is, is jubilant. It is safe to say, however, that the triumph is but a temporary one: for public opinion is arousing, and a public education society has been formed for the purpose of carrying on the agitation. The leading educators of the city, representative clergymen and lawyers, and not a few of the would-be progressive public-school teachers, met on Saturday last, and laid the foundations for the new society. It will, if we understand aright, take up the task of educating public opinion, and possibly will demand the appointment of a commission to investigate the schools and report a plan or plans for their improvement. This would be an excellent step, more especially as the present mayor enjoys the fullest confidence of the community, and could be safely trusted to appoint a commission that would do its work thoroughly and well. An attempt should also be made to displace the ringsters whose terms expire this year with better men. Four of the seven whose terms expire in December should on no account be re-appointed. The importance of this is well understood, and already representative citizens, like Dr. Mary Putnam Jacobi and Col. R. T. Auchmuty, are suggested for the vacancies.

The Springfield, Mass., *Republican*, in commenting on the condition of affairs, says that "the re-election of John Jasper as superintendent of the public schools of New York was a foregone conclusion. The Board of Education was as much on trial as the superintendent himself. The board exercises many of the prerogatives which in other cities belong to the superintendent, and it could not

be expected that it would pass a vote morally condemning its own acts. In the next place, the opposition, or, more properly speaking, the true friends of education in New York, began their attack by first selecting a candidate whose reputation, experience, and force of character were not equal to the tremendous work of reforming the present vicious system of instruction. The large results of the investigation of Mr. Jasper's records will appear next year, when he will be confronted by a rival candidate as well as his own record. The public has now been informed of the sad situation, and will be prepared for serious work when the next two years close and another election of superintendent takes place. When Mr. Kiddle withdrew, and Mr. Jasper took the New York schools in hand, the change was noticed at once. The teachers were all put in the position of wheels contributing to a nicety to the general movement, and the product was a machine-made pupil. The perfect examination was very much on a par with Showman Forepaugh's trick-elephant. If one teacher undertook to feed the starved minds of the little ones, then there was trouble with the machine, and the teacher was subdued." Every word of this is true, and is in full accord with the position that *Science* has taken in this important matter. If the Public Education Society does its full duty, the situation will be materially altered before another election takes place.

THE LONDON PUBLISHERS and printers are getting more and more excited over the provision of the Chace international copyright bill, which requires a foreign book copyrighted in this country to be printed from types set up in the United States. The printing and allied trades section of the London Chamber of Commerce has sent a resolution to the Chamber of Commerce, asking the government to obtain by diplomatic means the withdrawal of the objectionable provision, and, if this is not done, demanding that a similar law be passed in England. What the English publishers and printers desire is an opportunity to make all books written or compiled in Great Britain and sold in the American markets. That is something that the Congress of the United States will never agree to, if the passage of an international copyright act is postponed a quarter of a century. England may prevent books printed in America from being sold in Great Britain, but will never succeed in dictating in what shape a law shall be passed by the Congress of the United States until the former raises a generation of abler diplomatists than she has lately sent abroad.

AN ITEM PUBLISHED in the Washington papers last Saturday, entitled 'The Army Ahead,' in which it is represented that competitive tests of the 'indications' work of the Signal Office, to determine the relative merits of military and civilian officers in the performance of this work, had been made, is likely to mislead any one who has not read the description of the present condition of affairs in the Signal Office, published in the last issue of *Science*. The predictions for February were made by Lieutenant Dunwoody, and those for March by Prof. Cleveland Abbe. The percentages of verifications for each month have been computed by Professor Marvin, who found the record as follows: Professor Abbe, indications 75.42 per cent, storm-signals 62.50 per cent, cold-wave signals 53.99 per cent; Lieutenant Dunwoody, indications 80.55 per cent, storm-signals 89.29 per cent, cold-wave signals 86.11 per cent. It should be remembered, that years ago, when the weather reports became most popular and there were nothing but compliments for its predictions, Professor Abbe, then in thorough practice, prepared the indications for a long time. Of late he has been engaged in an entirely different line of scientific work, and it was not to be expected that he would be as successful in preparing indications as an officer who had lately been engaged in that service. General Greely's purpose in putting Professor Abbe upon this duty at all was to train civilians for it in case Congress, as seemed more than probable, should transfer the weather bureau to a civil department.

THE CRENITIC HYPOTHESIS AND MOUNTAIN-BUILDING.

THE facts derived from the study of metamorphic rocks and volcanic phenomena make it evident that there are two types of motion which take place in the deeper-buried materials of the earth's crust. One of these classes of movements occurs when volcanic ejecta creep horizontally towards the vent, or when the materials which afford the support of mountain-arches undergo massive movements towards the base of such folds in the rocks. In these cases of horizontal movements we have translations of extensive bodies of matter for considerable distances. The other class of movements taking place in the crust are in a vertical direction. They are brought up in part by the action of water, and in part by the action of igneous forces. The operation of these agents leads to a very extensive transfer of material in a vertical path, from the deeper-buried to the more superficial strata. I propose in the following pages to consider the general effect of this upward movement of matter upon mountain-building.

The simple inspection of most mountain-built districts will show the observer that there has been a very extensive movement of materials from lower to higher levels in the crust in such areas. Taking a considerable surface of mountainous country, where by chance the bed-rocks are exposed to view, we almost always find in such regions numerous veins and dikes. Thus, in the anticlinal districts of New England, especially where those portions of the surface are exposed along the seashore, we are often able to ascertain, that, on the path traversed by a straight line a mile in length, the addition to the material in the more superficial rocks has been sufficient to produce a considerable extension of their area. In some sections having this length, I have been able to prove that the increase in the horizontal section, due to the introduction of the materials derived from below, amounts to as much as from ten to twenty per cent of the original area; or, in other words, on a line a mile in length, the dikes and veins occupy from one-tenth to one-fifth of the distance. Besides the distinct intrusions of matter in the form of dikes and veins, there have in many instances been large contributions to the more elevated parts of the crust through the interstitial contributions of crystalline material. Thus in some of our highly metamorphosed rocks, where the materials have assumed the crystalline structure, a progressive growth of the hornblendic and other aggregations has been observed; so that, besides the contributions of matter which we may reckon from a study of dikes and veins, there is often a large but incomputable element of crystalline growth, serving to extend the rocks, which is not readily to be taken into account.

The immediate causes of this transfer of material from the deeper-lying to the more superficial parts of the earth's crust are now tolerably well known. In large measure it is due to the peculiar effect of temperature upon the water which was enclosed in the sedimentary rocks at the time of their formation, or which may have penetrated into them from the surface. The process of burial beneath sedimentary formed accumulations acts in all cases to lift the temperature of all the rocks which are subjected to such covering. Where these rocks contain the waters of deposition, they are likely in time to be brought to a high degree of heat. The temperature to which they attain, and the pressure to which they are subjected, enable them to dissolve a large share of the materials with which they come in contact. Moving upward in the channels which may be opened by chance riftings of the superimposed strata, these waters, deprived of their power to retain the materials in solution by the loss of temperature in their upward journey, and the relinquishment of pressure which comes about at the same time, lay down deposits in the upper portions of the crust. In a similar manner the descending pluvial waters obtain in the deeper parts of the crust a store of dissolved materials, which, on their re-ascent, is likewise deposited in the higher rocks. Thus the movements of water below the drainage-level of the country inevitably operate to bring from below and deposit in the upper parts of the crust large amounts of mineral matter.

The nature of the forces which urge dike-stones from the deeper to the more elevated parts of the crust are not so clear as those involved in the formation of veins. It seems not unlikely that it is to

the expansive energy of the contained water that we owe, in part at least, the upward movement of such materials. It is clear that this is the case in true volcanic dikes, for all the phenomena of a volcano indicate that the mainspring of its movements is to be found in the vapor of water. The close likeness between ordinary volcanic dikes and those which we cannot assuredly connect with volcanoes leads us to the conclusion that all injections whatsoever are most likely due to expanding vapors. Be this as it may, the effects of dikes is to clearly remove the material from a great depth, and place it in more superficial rocks.

Although it is most likely that the crevices into which dikes find their way may occasionally owe their dislocations to the action of contraction attending on certain metamorphic changes, probably the greater part of such ruptures are due to strains connected with changes in the attitudes of the rocks. The dike material thus acts as wedges to fill in all the cavities accessible to the igneous rocks, as far as they are formed. It is evident, that, where this process is numerously repeated, a considerable horizontal extension of the rocks is necessarily brought about. Thus in many parts of New England, as is well shown along its extended shore-line, where the coast reveals the crystalline rocks, from one-tenth to one-twentieth of the superficial area is occupied by such dikes. Generally, where the conditions have been such as to induce an injection of dikes, there is a large amount of vein matter deposited in the same field which still further serves to produce an extension of area. Thus in the region about Eastport the gain in the superficial area due to these two causes amounts to somewhere near three per cent or five per cent of the superficies exposed on the present surface of the rock.

Let us suppose that within any area of the earth's surface the conditions are such as to favor, through the forces which lead to vein-building and those which operate to create dikes, the vertical migration of matter from considerable depths towards the surface. The result on the tensions in the crust at such a point will evidently be such as to favor the construction of mountains. The constant abstraction of material from the depths will lead to a diminution in the bulk of the deposits of that lower level, and a parallel augmentation of the strata nearer the surface. It may well be that the differential contraction of the earth's mass, being greater at lower levels than at higher altitudes in the section, may create a slight tendency to buckle into mountain-ridges in all parts of the crust: but, wherever this general contraction is combined with the crenitic action, we may expect to find a more complete development of mountain-chains; and such points will be the seats of folding, and they may by their wrinkles effect the necessary contraction of the crust, and thus prevent folding in other sections where the contraction of the whole sphere alone tends to produce wrinkling.

It seems to me that this hypothesis may, perhaps, explain the fact that regions which have long been the seat of active sedimentation naturally become the sites of mountain-building. James Hall and others have noted the fact, which so far has remained inexplicable, that the first stage in mountain-building consists in the production of extended sedimentary deposits of more than normal thickness. During the deposition of these sediments the earth's crust appears to be down-borne by their weight. After the subsidence some action sets up which leads finally to a certain elevation of the area, and consequently to a development of erosive action. As the deposits are worn away, the mountains rise higher and higher, as the folding becomes more and more intense.

Although the generalization concerning the formation of mountains which I have just stated has not been critically compared with the many instances of mountain-structure, it seems of sufficiently common occurrence to demand an explanation, and it very likely will prove true for all large mountain systems whatsoever. Is it not possible that we may account for the development of mountains through these series of changes in the following manner? viz., where, as along a shore-line, sediments are thickly accumulated, the first effect may well be the down-sinking of the region; then, as the thickness of the stratified section increases, and the blanket retaining the internal heat becomes deeper, the internal heat will be greatly increased in the lower portions of the section. This will induce an upward migration of the imprisoned waters, and consequently, in time, a transfer of material to higher levels in the rocks. The consequent expansion of these superjacent rocks will make them tend to buckle. The superficial strata may not have received any considerable infiltration or injection of the material, yet they may be contorted by movements in the subjacent rocks which have thus been increased in volume; in other words, an intensification of deposition, if the sediments attain a great depth, may in time lead to a reversal of the down-sinking movement and the construction of a mountain system in what was previously a basin of sedimentation.

This explanation of mountain-folds will probably not at all account for the development of the basilar uplifts or tableland elevations which are developed in connection with all or almost all important chains. It may well be the fact that the expansion of the overlying deposits through the upward deportation of matter is only one element in determining the formation of mountains. It may in the end turn out that mountains are the result of a tolerably complicated series of causations, in which secular refrigeration of the earth, the transfer of weight by the operations of erosion and deposition, and the subterranean migrations of matter, all take a part. It may indeed well be the fact that these internal movements of material are due to more than one cause. I am, however, inclined to believe that to this vertical movement of materials we owe in many cases a share of the conditions which bring about the formation of mountainous dislocations.

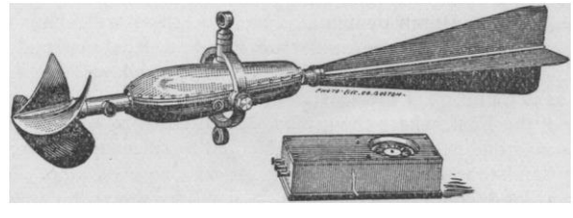
N. S. SHALER.

SCIENTIFIC NEWS IN WASHINGTON.

A New Instrument for measuring the Direction and Velocity of Submarine Currents. — Cabinets of Typical American Rocks, for Use in Colleges and Universities. — Beautiful Specimens of New Jersey Serpentine. — Ojibwa Pictographs in the West. — The Yellow-Fever has disappeared from Florida. — Interesting Phenomenon at Sea.

A Direction-Current Meter.

THE increasing commercial importance of our rivers and harbors, and the recent large annual appropriations for their improvement, have given a fresh impetus to the study of physical hydrography and hydraulics. It has come to be pretty generally recognized that no plans for the permanent improvement of tidal harbors, and such streams as the Mississippi and its tributaries, can be perfected without a thorough knowledge of the physical laws which underlie the complex phenomena they present. The investigation of these laws has stimulated observers and experimenters to the invention of many new and improved devices for the precise measurement of the various factors involved. One of the most interesting of these devices is a direction-current meter, recently perfected by Mr. E. S. Ritchie, the well-known maker of philosophical apparatus, of Boston, and Mr. E. E. Haskell of the United States Coast and Geodetic Survey. The characteristic feature of this meter is that it gives simultaneous measures of the direction and speed of a current. The direction is determined by means of a compass in all respects similar to Mr. Ritchie's trailing compass, which is mounted in an elongated chamber, whose axis coincides with the axis of the meter (see accompanying cut). A system of electro-magnets and



circuits connects the compass with a dial, which may be placed in any convenient position, in such a manner that the observer may make the dial indicate the same azimuth as the compass-needle. The speed of the current is measured by a conical propeller-wheel, whose flukes are curved in conformity with the requirements of theory for maximum rotary effect of moving water, and whose mass is as small as practicable with its requisite stability. The revolutions of the wheel are counted automatically by an electro-

chronographic register. The magnetic azimuth of the meter can be measured within a degree or two, and it is thought that current speeds as low as two-tenths of a foot per second can be accurately registered. This meter was used by the Coast and Geodetic Survey parties in their observations of currents in New York harbor last summer, and proved highly effective.

Cabinets of Typical American Rocks.

About four years ago Major Powell concluded to make a collection of all the typical rocks of the United States, systematically and scientifically arranged, so that a student of mineralogy, by comparing any piece of rock he might find with a corresponding specimen in the test collection, and studying the descriptions which would accompany the latter, might determine the name, composition, and proper classification of the unknown piece of rock he had in his hand. When this collection of typical rocks was complete, Director Powell proposed to have a number of duplicates of it made for gratuitous distribution to the leading colleges and universities of the country, for use in the classrooms as aids to the teaching and study of mineralogy.

Instructions were therefore issued to all the field-parties of the Geological Survey to collect and bring in specimens of the typical rocks of the regions they visited, and at first the work went on bravely. But what was everybody's business soon became nobody's business, the work of collecting was neglected, and finally little or nothing was done about it.

But Major Powell was unwilling to give the matter up, and about a year ago he assigned Prof. J. S. Diller especially to the work, and during the past few months it has been pushed forward with great vigor. A complete set of specimens of the typical rocks of the United States will be sent to the Cincinnati exhibition, and the work of preparing the duplicates is progressing very rapidly. Each set will consist of from one hundred and thirty to one hundred and forty specimens, each four inches long, three inches wide, and one inch thick; and there will be a pamphlet to accompany the collection, giving a description of each specimen. Two hundred of these sets are being prepared, and will be ready for distribution in about a year to those colleges and universities which file with Director Powell official application for them, and agree to make the use of them for which they are designed.

It will be impossible, of course, in a brief notice like the present, to give any thing like an adequate description of one of these collections; but a few outlines may convey to the reader some idea of their scope and the plan upon which they are arranged. Each collection will be divided into two departments. The first will be a sort of alphabetic collection, intended to show the general conditions of rocks, their structure, means of alterations, etc. For instance: one specimen will show a stratified rock, and another an unstratified one; a veined rock will be exhibited, also specimens of rocks jointed in various ways, those containing ripple-marks, limestone weathered by rain, spheroidal weathering in eruptive rocks and shale, rocks changed by the crumpling of strata, etc. In the second division the separate classes of rocks will be represented in their varying forms. For instance: in showing the stratified rocks not metamorphosed, the first specimen will be loose pebbles, or simple masses not cemented together; the second will show these simple masses partially cemented; and the third will show them entirely cemented, like the mill-stone grit and Roxbury puddingstone. In the same way a specimen of loose sand will be shown, such as is found upon the seashore; then sandstone like many of those of the East, where the grains are cemented by oxide of iron; then sandstone like the Potsdam, cemented by siliceous matter; and finally sandstone where the cement is carbonate of lime. Many different kinds and colors of sandstones will be shown, so as to enable the student to recognize by comparison any specimen of common sandstone he may have. In the same way the varieties of the other classes of rocks will be illustrated, — the volcanic; the limestones of every texture, variety of color, and degree of purity; infusorial earth and deposits of hot springs; gypsum; specimens showing all these rocks metamorphosed; sedimentary rocks; eruptive rocks; lavas of the same composition as granite, that came to the surface; and specimens ranging from the most acid granitic rock to the most basic.

From this brief outline it may be seen of what great practical value each of these collections may be made, if used as Major Powell designs that they should be. About forty institutions have already made application for sets.

Fine Specimens of Serpentine.

Among the mineralogical specimens which the National Museum will send with its collection to the Cincinnati exhibition will be some pieces of serpentine which are more beautiful, probably, than any previously exhibited in the United States. They were found in the Gordon limestone-quarry, near Montville, Morris County, N.J., and were collected by Prof. W. S. Yates, who was sent to Montville by the National Museum last summer for the purpose. The specimens are of a light yellowish-green color, differing entirely from the pure green serpentine metamorphosed from olivine rocks, which occurs in mountain-masses near both the Atlantic and Pacific coasts.

Prof. G. P. Merrill, curator of rocks, etc., at the National Museum, who has studied these specimens, has determined that the serpentine has been derived from the alteration of pyroxene; in fact, in nearly all the specimens the process of alteration is incomplete, the serpentine surrounding the pyroxene, which remains unaltered in the centre. A number of the specimens, ranging from a few inches to a foot and a half in diameter, have been cut open, and the exposed surface polished in the laboratory of the Geological Survey, and these show the structure and bring out the colors very beautifully.

These specimens are found in comparatively small masses, — from a few inches to a few feet in diameter, — irregularly distributed through the limestone, and the pyroxene from which it is derived occurs only in such limestone as has been metamorphosed by the mountain-building forces. The only other locality in which similar serpentine has been found in the United States and described is in the Leadville region, Colorado, where it was discovered by Professor Emmons, and treated of in his recent report. A peculiarity both of the commoner serpentine derived from eruptive rocks, and also of that metamorphosed from pyroxene, is the frequent occurrence of slickenside, showing that the rocks have been subjected to great pressure and movement.

Some of the New Jersey serpentine has already been utilized in ornamentation.

Ojibwa Pictographs in the West.

"In the neighborhood of Odanah, on the Bad River," says Capt. Garrick Mallory of the Bureau of Ethnology, in a paper from which extracts have already been made in *Science*, "is a large, vertical, soft rock on which pictographs are still to be observed, although nearly obliterated. The objects figured are chiefly birds and quadrupeds, many of them being repeated, and are all probably totemic. Indeed, that is the direct evidence of an old Indian who saw some of them made in his boyhood. He says that when Indian visitors came by there, that being on a well-known trail, they would each cut his totem on the rock to show to what clan he belonged, either to establish his identity to the resident Indians who might happen to be present, or as a record of his passage. This is interesting in comparison with a similar proceeding in New Mexico and Arizona.

"In my examinations at three reservations in Wisconsin, I discovered some variants of the Medé ceremonies. The full ceremonies of the Medé lodges, which they call 'grand medicine,' were performed twice a year, — in the fall and in the spring. Those in the spring were of a rejoicing character, to welcome the return of the good spirits; those in the fall were in lamentation for the departure of the beneficent spirits. The drums were beaten four days and nights before the dance, which lasted for a whole day. After the dance twelve selected persons built a lodge, about the centre of which were stones, which were heated, and dancing went on around it until the stones were moistened by the sweat of the performers. Singing, of course, was an accompaniment of the dances. These ceremonies were performed by the body of the people, and were independent of the initiations of the secret order. With regard to the candidates who passed initiations, it was observed that they always became stronger and better men; perhaps because those were the ones who had the requisite strength of mind and body to endure the various ordeals, and to understand the mysteries.

"The general remark may be made with regard to the Ojibwa in the several localities where they are now found with the least amount of civilized influence, that they in a marked degree live a life of religious practices, and that their shamanistic societies have a wonderful influence over their sociologic and religious character. This is to so great an extent (before not appreciated), that, in my opinion, a careful study of these people will develop facts corresponding in interest with those which have recently surprised the world as reported by Mr. Cushing among the Zuñi. There is probably no body of Indians in the United States whose inner life can now be studied to greater advantage than the remoter bands of the Ojibwa. With reference to the subject with which this paper is more directly concerned, that is, pictographs in their various modes of representation, it is certain that the understanding of the mythology and religion of these people will furnish the best interpretation to their ancient drawings and etchings.

"It is desirable to explain the mode of using the Medé and other bark records of the Ojibwa. The devices are not only mnemonic, but are also ideographic and descriptive. They are not merely invented to express or memorize the subject, but are evolved therefrom. A general mode of explaining the so-called 'symbolism' is by a suggestion that the charts of the order, or the song of a myth, should be likened to the popular illustrated poems and songs lately published in *Harper's Magazine;* for instance, 'Sally in our Alley,' where every stanza has an appropriate illustration. Now, suppose that the text was obliterated forever, — indeed, the art of reading lost, — the illustrations remaining, as also the memory to many persons of the ballad: the illustrations, kept in order, would supply always the order of the stanzas, and also the general subject-matter of each particular stanza, and the latter would be a reminder of the words. This is what the rolls of birch-bark do to the initiated Ojibwa, and what Schoolcraft pretended, in some cases, to show, but what, for actual understanding, requires the obtaining of the literation of the actual songs and charges of the initiation ceremonies, or in other instances the literation in the aboriginal language of the non-esoteric songs and stories."

Yellow-Fever in Florida.

Dr. Jerome Cochran, of the State Board of Health of Alabama, in a recent report has stated that the late epidemic of yellow-fever in Florida was not introduced into the State by the usual trade channels, but by smugglers. This confirms unofficial statements received by Supervising Surgeon-General Hamilton, of the marine-hospital service, several weeks ago. Dr. Cochran says that the last case was discharged May 11, and the last death May 8, and that there have been active precautions taken to prevent the reappearance of the disease.

Interesting Phenomenon.

Captain Friis, of the Norwegian steamship 'Viking,' reports to the Hydrographic Office that he observed at midnight, April 20, between Chatham and Davis South Shoal, when the moon was in its last quarter and about two hours above the horizon, two dark-looking narrow strata of clouds; the upper one extending across the face of the moon, the upper and lower limbs of the latter appearing above and below the cloud-stratum. The cloud was moving south-westerly. On the same line with the moon, and to the westward of it, was a nearly circular luminous spot, larger than the moon, which looked as the sun might when shining through a thick mist. The second stratum of cloud was about halfway between the first and the horizon. The phenomenon continued until the moon set at two o'clock, when there shot upwards from the upper limb fan-shaped rays of light.

HEALTH MATTERS.

Yellow-Fever.

IN a recent number of the *Medical Record* is published a letter from Dr. Charles Finlay of Havana, dated April 17, 1888, in which he says, —

"In your issue of April 7 there is a short paragraph stating that the microbe of yellow-fever described and cultivated by Dr. Domingos Freire of Rio Janeiro 'has gone the way of many other specific germs,' your grounds for this assertion being that Dr. Gibier 'denies utterly the existence of the germ claimed to be specific.' This conclusion has evidently been come to under the impression that the Parisian bacteriologist just mentioned has had full opportunities for verifying in Havana, within the brief space of six weeks, the results previously obtained in Brazil by Dr. Freire, in such a manner as to warrant his abrupt denial of what he had so warmly approved while experimenting in Paris upon Dr. Freire's Brazilian cultures. That such has not been the case, I think you will admit after hearing the particulars of that investigation.

"Dr. Gibier saw his first yellow-fever case on Nov. 16, at the military hospital of this city. Between that date and Dec. 28, he examined altogether five patients, and performed four autopsies. He collected fresh blood from four of the patients, and urine from three, besides the pieces of viscera and secretions from the cadavers. In the urine of the first patient he thought at first that he had recognized Dr. Freire's micrococcus, but afterward changed his mind, having 'satisfied himself' that what he had seen were mere insignificant organic granulations. In the blood and secretions, as also in the sections of viscera, he failed to discover any micro-organisms, nor did he succeed in developing any colonies in his numerous attempts with the same pathological material. One of the tubes of agar-agar jelly inoculated by him with heart-blood, and presented to a military colleague, did, however, develop a yellow superficial colony, which Dr. Gibier attributed to an accidental atmospheric contamination, although the constituents of the colony turned out to be a tetragenous microbe quite distinct from the plain atmospheric micrococcus with which he had thought it could be identified.

"This scanty material, collected at a time when yellow-fever was sporadic in Havana, almost the only cases signalled being those present at the military hospital, constitutes the sole foundation for the abrupt retractation of Dr. Gibier from his former enthusiastic advocacy of Dr. Freire's views; never considering that the sporadic and epidemic forms of the disease might not be identical, any more than the equivalent forms of cholera have turned out to be, notwithstanding their clinical resemblance. Other observers had previously noticed that the same yellow-fever products which, in their hands, had given colonies when collected from epidemic cases, failed to do so with the sporadic. In collecting blood from yellow-fever patients, Dr. Gibier was noticed to disinfect the skin with bichloride solution, but took no pains to remove any excess of the germicide which might remain and sterilize the drop of blood as it would ooze out on the surface. Neither does it appear that he varied his culture-media as to acidity, alkalinity, etc., nor that he kept his tubes at a uniform summer temperature. Yet, in spite of such obvious deficiencies, Dr. Gibier does not hesitate to condemn as erroneous the results of Dr. Freire's patient and laborious investigations, and likewise all others that might claim to have obtained successful cultures from similar yellow-fever products.

"Dr. Gibier had brought over some cultures proceeding from Dr. Freire's own tubes, inoculated at Rio Janeiro; and shortly after his arrival in Havana, full of faith in their prophylactic virtue, he inoculated himself, and thought he had gone through the phenomena of an experimental attack of yellow-fever. In this, I fancied at the time, and he now acknowledges, that he was mistaken; but after examining my own cultures from yellow-fever blood and urine, obtained by me last summer in Havana, and cultivated in sub-acid agar-agar jelly, he has repeatedly declared that both macroscopically and microscopically they were identical to Dr. Freire's. This coincidence, one would think, should have checked his precipitancy, and induced him, at any rate, to wait until the epidemic season before formulating his conclusions.

"The only excuse, if so it can be called, for such haste in a practised bacteriologist, must lie in his unacquaintance with the disease, and in his anxiety to proclaim a new bacillus of his own, isolated from the intestinal contents of yellow-fever cadavers, and which he believes better entitled than its fellow claimants to be considered as the true yellow-fever germ.

"My object in bringing forward these facts is to guard the American medical public against hasty deductions, and to show that Dr. Gibier's researches have not in any way altered the previ-

ous state of the question, except in so far that he has added another microbe to the list of the possible specific germs of the disease."

This would seem to make it very doubtful whether Dr. Gibier of Paris has added any thing to our knowledge of the cause of yellow-fever.

ELECTRICAL SCIENCE.

Novel Current-Registering Instrument.

A NEW instrument for measuring the quantity of current supplied to consumers has been recently brought out by Prof. Elihu Thomson, although it seems probable that the principle on which it works was originally due to Tavener. Two bulbs are connected by a U-shaped tube, and the whole is partly filled with liquid; alcohol, for instance. The arrangement is pivoted, so that, if more of the liquid is forced into one of the bulbs, the difference of weight will cant the apparatus, and its movement is communicated through a ratchet to the hands of a registering-dial. To make this measure the current, two spirals of wire are introduced into the liquid, one in each bulb. If we suppose the instrument has been canted, the spiral in the lower bulb has its circuit made, while that of the upper spiral is broken. The consequence is, that the liquid in the lower bulb is heated, its vapor-tension increases, and part of it is driven through the U-tube. The section of the latter is very small, so that the liquid passes slowly; but in a time, depending upon this section and on the rate of heating, the upper bulb becomes the heavier, and the apparatus cants, breaking the circuit of the spiral that was previously made, and making the other. By a suitable registering system the readings may be made proportional to the current which is flowing. The current, then, is measured by its heating effect, and the instrument may be used for both direct and alternating currents. In the latter case the readings would be fairly correct if lamps only were used; but, if motors were to be run, the readings would not be proportional to the power consumed. This objection holds with all of the instruments that have yet been proposed for the measurement of the consumption of alternating currents.

THE SHORT SERIES ELECTRIC RAILWAY SYSTEM. — The Short system of electric traction differs from those ordinarily used in that the current is distributed in series, the same current passing through all of the cars on the line. Both overhead and conduit wires are used. In the latter case the wires are contained in an iron conduit, from which they are insulated by porcelain brackets. The overhead wires are supported from iron bracket-poles that arch gracefully over the track. The motors and generators used are of the Brush system. The motor is usually in a front compartment, and is geared to the front car-axle. There is a pinion on the motor-shaft, a gear on the axle, and an intermediate gear and pinion that further reduces the number of revolutions. The gears are made of steel, the pinions of rawhide held between steel plates, making an efficient and noiseless transmitting system. The front compartment (in which the driver stands), with the motor and front truck, can be made separately, and attached to any ordinary car by removing the front platform. Taken altogether, the system seems a simple and efficient one.

AN IMPROVEMENT IN SECONDARY BATTERIES. — A seemingly slight improvement in the construction of secondary batteries, and yet one that in certain cases will be of considerable value, has recently been patented by Mr. J. S. Sellon. A great difficulty and expense in the use of accumulators arises from the fact that the plates cannot be separately and easily removed. Usually, if we wish to connect a number of cells in series, all of the positve plates in each cell are connected together by lead strips, which are taken to similar strips connecting the negative plates of the next cell. The terminals of each plate are burned to the connecting-strip; and when one of the plates gives out, and we wish to renew it, we must take out the complete set of plates, cut off the one we wish to renew, and solder on another. Besides being difficult, this takes a good deal of time, and increases the cost of maintenance of the battery; it is obvious, too, that it interrupts its use. Mr. Sellon's idea is to have plates made in pairs, a positive and negative, so connected that when one of them is in one cell the other will be in another. The first and last cells have one set of single plates connected with the terminals of the external circuit. The advantages of this arrangement are, that plates can be removed and renewed without interfering with the action of the battery, and much more easily than if one of a number of connected plates had to be removed. Any improvement in storage-batteries is important at this time, when its advantages, especially for tramway-work, hang in the balance. A slight increase in efficiency will cause their adoption for street-car work, and the invention of Mr. Sellon is in the right direction.

INFLUENCE OF TEMPERATURE ON THE MAGNETIZATION OF IRON. — M. C. Ledeboer has made some interesting experiments on the magnetic properties of iron at high temperatures. Many experiments have been made on the same subject; and it has been found that up to three or four hundred degrees there is no great change in the magnetic permeability of iron, while at a red heat its magnetic properties almost entirely disappear. The necessary temperature of the iron bar used in the experiment was obtained by a spiral of platinum wire wrapped around it, separated from it by a layer of mica. Between the platinum and the iron was a small thermo-electric couple, which was used to measure the temperature of the bar. A heavy electric current sent through the platinum spiral could be regulated to give any desired temperature. The bar used was thick as compared with its length, which fact prevented any useful results as to residual magnetism being obtained. M. Ledeboer arrives at the following results: up to a temperature of about 680° the magnetic permeability remains nearly constant, after 680° the diminution is very rapid, and the iron ceases to be magnetic at 760°. This range of temperature is about that in which several curious phenomena occur, — an abrupt change in the specific heat, a change in the tortional co-efficient, etc.; and it is probable that a more complete study of iron in this region of temperature will help us to connect phenomena which seem now so different in character.

THE MORDEY ALTERNATING-CURRENT DYNAMO. — This dynamo has revolving magnets and a fixed armature. The latter consists of a number of coils of narrow copper ribbon wound on insulating-cores: they are fixed to project from the inner circumference of a metal ring which is fastened firmly to the bed-plate of the dynamo. The magnet consists of a short iron core, whose axis is the axle of the machine, and which is wound with wire supplied with current from the small dynamo used as an exciter. From each end of the magnet extend arms, which are bent until they are opposite one another, leaving only enough space between for the flat coils of the armature to pass. We thus have a number of poles of the same sign, opposite to which are poles of the opposite sign, while between the poles are vacant spaces. The action of the machine is now easily understood: as the magnet revolves, the armature coils are first opposite pole-pieces, where a number of lines of force pass through them; then in vacant spaces, where there are no lines of force. The variation, of course, produces the electro-motive force of the machine.

INCANDESCENT LAMPS IN EXPLOSIVE GASES. — Lieutenant Hutchins, U.S.N., has been experimenting on the effect of breaking incandescent lamps in explosive gases. The filament of the lamp breaks almost immediately that the glass is broken, and as soon as it breaks, of course, and cools down, the danger is over. The question was whether the breaking and cooling were so rapid that the gases would not be brought to a sufficiently high temperature to explode. With a Swan 16-candle power lamp, in a mixture of hydrogen and oxygen, the gas exploded immediately the bulb was pierced: the filament was not broken. The same result was obtained with marsh-gas. A Maxim lamp was tried in a mixture of coal-gas and air, with a similar result. Lieutenant Hutchins concludes, that, where explosive gases are allowed to collect on board ship, incandescent electric lights are dangerous.

BOOK-REVIEWS.

A Text-Book of Biology. By J. R. AINSWORTH DAVIS. Philadelphia, Blakiston. $4.

THE number of text-books of biology which have been published within recent years has been, it would seem, sufficiently great to meet all reasonable demands; and yet, after perusing this new one

by Mr. Davis, we are satisfied that it supplies deficiencies which exist in all the text-books which have up to this time appeared. While the others have been largely practical, this one is more theoretical, and, as is indicated on the titlepage, is especially designed to prepare students for their scientific examinations. This design is further elaborated in an appendix, which contains a full bibliography of the works referred to in the text, a series of examination-questions, and an index-glossary. The volume is divided into two parts, — a botanical and a zoölogical, — each of which deals with a number of types morphologically and physiologically, then briefly draws out the points of comparison between them, and ends with an outline of classification.

In Part I., which treats of vegetable morphology and physiology, fungi are first considered; *Saccharomyces, Bacteria, Mucor mucedo*, and *Penicillium glaucum* being selected as types. Of *Algæ*, the author describes *Protococcus pluvialis, Spirogyra, Fucus, Chara*, and *Nitella*. *Funaria* and *Polytrichum* are selected as representing the mosses. *Pteris aquilina* and *Nephrodium filix-mas*, the ferns; *Pinus*, the gymnosperms. The consideration of the angiosperms follows.

In Part II., which is devoted to animal morphology and physiology, the *Protozoa* are first dealt with through their representatives the *Amœba* and *Vorticella*. The *Hydra* represents *Cœlenterata; Distoma* and *Lumbricus, Vermes; Astacus, Arthropoda; Anodonta* and *Unio*, and *Helix, Mollusca; Rana, Amphibia; Columba livia, Aves; Lepus cuniculus, Mammalia*.

No less than one hundred and fifty-eight well-executed illustrations add to the attractiveness of the book, as well as elucidate the text. We recommend the work not only to those for whom it was originally designed, but to all students and readers who desire to obtain within a small compass the most recent reliable information on the subjects of vegetable and animal morphology and physiology.

Ethics of Boxing and Manly Sport. By JOHN BOYLE O'REILLY. Boston, Ticknor. 12°. $1.50.

THE main purpose of this book, as stated by its author, is to bring into consideration the high value, moral and intellectual as well as physical, of those exercises that develop healthy constitutions, cheerful minds, manly self-confidence, and appreciation of the beauties of nature and natural enjoyment. He further says, that so long as large numbers of our young people of both sexes are narrow-chested, thin-limbed, their muscles growing soft as their fat grows hard, timid in the face of danger, and ignorant of the great and varied exercises that are as needful to the strong body as letters to the informed mind, such books as this need no excuse for their publication.

The contents of the volume are subdivided into four sections: 1. The ethics and evolution of boxing; 2. The training of athletes tested by every-day life; 3. Ancient Irish athletic games, exercises, and weapons; 4. Canoeing sketches. Under the first the author discusses the question whether boxing has a real value. He believes that it has, and in support of his belief quotes the opinions of Sir Robert Peel, Mr. Evelyn Denison, Lord Althorp, Dr. Oliver Wendell Holmes, and others. Lord Althorp, the minister who led the British Commons when the Reform Bill was passed, was evidently an enthusiast on this subject. He said that his conviction of the advantages of pugilism was so strong that he had seriously been considering whether it was not a duty that he owed to the public to attend every prize-fight which took place, and thus to encourage the noble science to the extent of his power. In speaking of the improvement in modern boxing, the author believes that the English practice of prize-fighting with bare hands and under improper rules has brought boxing into disrepute. He praises Sullivan for having made a manly effort to establish the practice not only of sparring, but of fighting, with large gloves, and for insisting that contests should be ruled by three-minute rounds of fair boxing. The Grecian athletes, their training and skill, and the gladiators of Rome, are referred to and described. Feudalism suppressed popular athletic exercises. With the advent of chivalry, the art of boxing waned and became unfashionable. With the advance of feudalism came the growth of iron armor, until at last a fighting man resembled an armadillo · he was iron-clad from top to toe. The first modern champion boxer was James Figg, who was considered, in 1729, as the national champion. The first rules for the government of 'the ring' were prepared by Broughton, and were in force from 1743 to 1838.

In discussing the training of athletes as tested by every-day life, the author considers the question from two different standpoints, — that of the professional athlete, and that of the average person who wants to get into lasting 'good condition.' He thinks that the mass of those who live in cities, and whose occupations involve little manual or physical exercise, allow their bodies, at an early age of manhood, to sink out of all trained and athletic strength and shapeliness. He says that it is only necessary to visit a Turkish bath to find abundant evidence of the muscular collapse which has overtaken the modern city-dweller, — bodies 'developed' everywhere in the wrong direction, arms like pipe-stems, while the beautiful muscles of the shoulders and back are smothered in layers of vile fat, and spindle thighs and straight calves weakly support bellies like Bacchus. Excellent hints are given on training and the ways of promoting good health. A large number of illustrations make the volume very attractive, and accounts of canoeing on the Connecticut, Delaware, and Susquehanna Rivers add to the interest which its perusal has excited. The book, taken as a whole, is unique, and treats of questions which have seldom been so well and so thoroughly handled.

Medical Nursing: Lectures delivered in the Royal Infirmary, Glasgow. By J. WALLACE ANDERSON, M.D. 3d ed. Glasgow, James Maclehose & Sons. 16°. $1.

FOR many years the nurses at this Royal Infirmary of Glasgow have been practically trained in the duties pertaining to their profession. About ten years ago the managers resolved that a course of systematic lectures on nursing should be added to the practical training; and Dr. Anderson was selected to deliver the medical lectures, which are contained in the volume before us. In ten lectures the author has succeeded in condensing a vast amount of information. Modern nursing dates from the year 1836, when Theodore Fliedner, a German-Protestant clergyman, established the Deaconess Institution at Kaiserwerth on the Rhine. There, under the superintendence of himself and his wife, a training-school for female nurses was begun. The labors of Florence Nightingale, with her staff of thirty-seven nurses, in the Crimea, in 1854, are too well-known to need more than a reference. It was from such work as this of Fliedner and Florence Nightingale that all the training-schools for nurses have come. There is now hardly a hospital in the United States that has not such a school in connection with it. The lectures of Dr. Anderson deal with subjects which are essential for every nurse to know: how to obtain and record a patient's temperature, pulse, and respiration; how to prepare food for the invalid so as to make it both nutritious and palatable; how to prevent bed-sores; how to prepare fomentations and poultices. These and many other practical lessons are thoroughly taught in this little volume. In an appendix the author gives valuable recipes for the preparation of food for the sick, and a list of poisons with their antidotes. One feature of the book which we regard as of considerable worth is a list of questions at the end of each lecture. These questions bring out the salient points of the lectures, and direct attention to the most important subjects for study. There have been published other and more pretentious text-books on nursing, but we know of none that in so compact a form contains so many essentials as 'Medical Nursing.'

Bradley's Atlas of the World, for Commercial and Library Reference. Philadelphia, WILLIAM M. BRADLEY & BROTHER, 1887. f°. $25.

THIS atlas has received high praise from Dr. McCosh, Professor Libbey, Dr. Vincent, General Hazen, and others. The intention of the work is to provide a complete American and foreign atlas, full and detailed, for both hemispheres. Following a somewhat novel plan for an American atlas, the eastern hemisphere is given first. But it is the belief of the publishers that every portion of the world is equally treated. The maps contain the results of recent investigations, so far as this is possible in any atlas of this size, and each map is accompanied with an isometric index. By means of this index the

position of all places indicated on the maps may be readily found. For American towns the population is given with the index. For the eastern hemisphere a separate population table is given. Throughout the work it has been a fixed aim to render the maps easily legible, and not tiresome to the eye in consultation.

NOTES AND NEWS.

THE committee appointed by the New Jersey Assembly of the Agassiz Association at its semi-annual meeting, held in the chapel of Rutgers College, May 12, to arrange for a seaside assembly during the coming summer, organized itself by the election of Rev. L. H. Lighthipe, Woodbridge, N.J., as chairman, and Prof. P. T. Austen of Rutgers College, New Brunswick, N.J., as secretary. The plan as sketched out by the committee is somewhat as follows. The assembly is to be known as the 'Agassiz Seaside Assembly.' Its membership is to consist of such persons as shall send their names to the secretary before the opening of the assembly, or such as shall be elected members according to by-laws adopted afterward. It is proposed to make it a permanent organization; the membership fee to be one dollar per year, payable at the opening of each annual assembly. Membership badges and tickets will be provided for all who send in their names to the secretary. It is proposed to hold a six-days' session this year, at Asbury Park, N. J., provided suitable accommodations can be secured at that place in the month of August. The subjects to be discussed this year will be principally botany and entomology, under the direction of such practical specialists as can be secured. The work is to include several field-day excursions with experienced guides. Circulars setting forth these facts will be sent to all chapters within a radius of one hundred miles, and to any other chapters which may desire them. Chapters failing to receive them, or any persons desiring copies, can obtain them by addressing the secretary, Prof. P. T. Austen, Rutgers College, New Brunswick, N.J. Members will be entitled to free admission to all lectures and excursions, and will receive circulars before the opening of the assembly, giving full particulars as to time, place, railroad-trains, boarding accommodations, programme of exercises, etc. Membership is not limited to members of the Agassiz Association. It is extremely desirable that names be sent in as soon as possible, that the committee may know how far they may venture in the matter of expenses. All members of the Agassiz Association are cordially invited to co-operate with the committee in making the Seaside Assembly a success.

— According to the *Publishers' Weekly*, a gypsy-lore society has just been formed. The president is Mr. C. G. Leland; the vice-president, Mr. H. T. Crofton; and the members already include the Archduke Joseph of Hungary, Sir Richard Burton, M. Paul Bataillard, Dr. Alexander Paspati, and several more English and continental students of Romany. The society will publish a quarterly journal, the first part of which will appear on July 1, and copies of which will be strictly confined to members. The honorary secretary is Mr. David MacRitchie, 4 Archibald Place, Edinburgh.

— At a late meeting of the mineralogical branch of the New York Academy of Sciences, Mr. George F. Kunz described some remarkably complicated twin diamonds which have proved to be unusually hard. Some of these will be sent to Professor Rowland of Johns Hopkins University, Baltimore, for use in ruling the diffusion gratings he is making, and using in mapping the spectrum of the sun.

— A new slang dictionary is announced by the *Publishers' Weekly*, which will aim at exceptional completeness by enlisting the co-operation of specialists in different departments. The editors-in-chief are Prof. Albert Barrère of Woolwich, author of 'Argot and Slang,' and Mr. Charles G. Leland (Hans Breitmann); and among the contributors are the Earl of Suffolk, Sir Patrick Colquhoun, Major Arthur Griffiths, Dr. Charles Mackay, Mr. John Hollingshead, Rev. J. W. Horsley, and Prof. Douglas B. W. Saden. The character of the work may be judged from its sub-title: 'A Dictionary of Unconventional Phraseology, embracing English, American, and Colonial Slang; Tinker's, Yiddish, Pidgin, and Anglo-Indian Slang; Quaint Expressions, Vulgarisms — their Origin, Meaning, and Application.' It will be issued in two volumes, to subscribers only. Applications for the work should be addressed to G. May, care of Messrs. Whittaker & Co., 2 White Hart Street, Paternoster Square, London.

— Professor Langley, secretary of the Smithsonian Institution, has asked for an appropriation of $27,050 for the expenses of the system of international exchanges between the United States and foreign countries under the direction of the Smithsonian Institution, instead of the $15,000 previously estimated for. In his letter of explanation he says that there is now an amount of matter (virtually presents to the United States) which could be secured if the institution had the larger sum at its disposal.

— The British Parliamentary Currency Commission will report in favor of the remonitization of silver. It proposes a convention of the leading commercial nations of the world to agree upon a system of weights and coinage under which gold and silver shall be exchanged in international transactions. If such an agreement could be reached, it would probably be a blessing to the world. No one nation can remonitize silver without the co operation of others, but the whole commercial world can do it.

— The feature of the meeting of the British Royal Society last week was an exhibition by Mr. Henry Burns of a class of nests of live ants. These were so arranged that all the elaborate internal economy of the insects could be fully observed. A cable despatch says that "in one cell was the queen, with servants attending upon her. In another were the aphides, or cows, watchfully herded by their keepers; and a party of workers were engaged in walling up an intruding queen which had been placed in the nest that morning. The state of ant civilization was so remarkably high, that nobody would have been much surprised at a party of scientific ants in spectacles taking notes on the Royal Society."

— The Nicaragua Canal surveying party, under Civil Engineer Menocal, have discovered that a new route, which they call 'the upper one,' is much more favorable for the line of the canal than the one recommended in 1885. By this new route it is said that the total length of the excavation from Ochoa to Greytown will not exceed nineteen miles, and will consist of several short embankments instead of one long one. The cost, it is said, will be greatly reduced, and the engineering difficulties much less.

— A new chemical process of producing aluminium, invented by Professor Curt Netto of Dresden, is thus described: "The ore used is cryolite, a double fluoride of aluminium and sodium, ground to a fine powder, and fluxed with common salt. The ore is then melted in a reverberatory furnace, and when quite liquid is run into a ladle. When in this condition, ingots of solid sodium are forced to the bottom of the ladle, and there held until they become volatilized. The gaseous sodium rising through the molten cryolite displaces a part of the aluminium, which collects in a metallic form at the bottom of the ladle. The greater part of the slag is then skimmed off, and the remainder poured into an iron crucible to cool. When the mass is turned out, a solid ingot of aluminium is found at the bottom."

— An item of interest in connection with the proposed introduction of 'World-English' is going the rounds of the press, crediting President Eliot of Harvard College with having said, "I sat down to dinner one stormy night, in a Swiss inn, with sixteen people. Six different nationalities were represented by these sixteen people, and the only language that they could all speak was English. One may travel now, as I have just travelled, through southern Spain, through northern Africa, through Greece and Constantinople, and back by Vienna, and the more usual routes, with nothing but English. I do not mean to say that you may not occasionally feel the need of some French words, but you can travel comfortably through all these countries with no language but English. That, I am sure, could not have been said twenty-five years ago. The spread of the language within that time for purposes of commerce is most noticeable, as is also the increased knowledge of the language and literature among educated people on the continent of Europe."

— The intention with which *The Universal Review* (London, Swan, Sonnenschein, Lowrey, & Co.; New York, International News Co.) has been founded is twofold, — that of supplying a journal of international character, and of making one interesting to all classes of readers. The services have been obtained of some of the best writers of France, Germany, and America, as well as those of England. Special correspondents have been established in the chief cities of the Continent, America, and the Colonies, who will supply information as to the principal political, social, intellectual, and artistic movements therein. A considerable portion of its space will be devoted to three matters which at present have almost entirely disappeared from review literature, — the arts of painting, fiction, and the drama. On all of these there are promised not only numerous articles, but examples of the best original work which is being done at the present time. Thus *The Review* will publish reproductions of fine pictures and drawings, ancient and modern. It will also differ from its serious contemporaries by including the subject of sport. The pages will be open to duly qualified correspondents, in the belief that there are many men, whose opinions are of value, who will welcome the opportunity of expressing their views on questions of the day in a manner at once less lengthy and less formal than is necessitated by a review article, and in a more permanent form than is afforded by the columns of a newspaper. As to the more serious political, religious, scientific, and scholarly matters, which must form the backbone of any important review, *The Review* will take no partisan view, and will admit opinions of every kind which seem to be founded upon adequate knowledge. —— Charles Scribner's Sons have published, in connection with the railway articles appearing in *Scribner's Magazine*, a pretty lithographed folder, entitled 'Twenty Questions and Answers about Railways.' The information contained is interesting, and has been obtained from well-known authorities. It can be obtained by enclosing stamp to the publishers. —— Two articles are promised in *The Popular Science Monthly* for July that are worthy of attention. They are an illustrated paper on 'Safety in House-Drainage,' by William E. Hoyt, S.B., in which the belief that plumbing-fixtures in our houses are inevitable sources of danger is controverted, and ways are shown for making them safe; and the concluding essay of the series on 'Darwinism and the Christian Faith.' —— D. Appleton & Co. have just gotten out the July number of their *Educational Notes*. This is profusely illustrated, and gives a most tempting summary of several of their newer educational books. —— H. Semler's 'Die Tropische Agricultur,' a handbook for the agriculturist and merchant, issued in parts by the Hinstorff'sche Hofbuchhandlung, Wismar, Mecklenburg, has just been completed. The work is of especial importance to those who give their attention to the cultivation of tropical products in the United States, such as oranges, lemons, cotton, maize, tobacco, sugar, etc. The International News Company of New York are the American agents for the work, which is complete in three large volumes. —— Messrs. Dodd, Mead, & Co., New York, have issued a new catalogue of rare and choice books, which they offer at discounts in view of the approaching summer season. Among them we note a copy of the first printed edition of 'Euclid,' the first book printed with woodcut diagrams. —— C. N. Caspar, Milwaukee, Wis., announces to appear in June, Linderfelt's 'English Volapük Dictionary.' —— Messrs. E. & F. N. Spon, New York, have just published 'A System of Easy Lettering,' by J. H. Cromwell. The author divides any surface he may wish to letter into squares (or parallelograms, as the case may be) in pencil-lines; forms the required letters in ink or paint, and according to the style chosen; then erases the pencil-lines, and the lettering is complete.

— Chauncey Smith says the magnitude of the commercial interests which have been called into being by physical discoveries and the devlopment of new ideas, indicates, that if the progress of the past few years is to continue, if new achievements are to rival those of the past, it must be by a higher education and training, not of a few men, but of the many, so that no germ of talent shall miss its opportunity for development and its chance for increasing the powers and resources of man.

— The Canadians themselves are ignorant of most of the vast mineral riches their country contains, and comparatively indifferent to what they do know, so that the revelations of a recent parliamentary committee report on the great Mackenzie basin are as unexpected there as here, according to the *Engineering and Mining Journal*. Of the minerals of this vast region, little is known. Nothing is known of the minerals which may exist east of the Mackenzie River and north of the Great Slave Lake. Enough is known of the western affluents of the Mackenzie, the committee thinks, to show that at the head waters of the Peace, Liard, and Peel Rivers there are from 150,000 to 200,000 square miles which may be considered auriferous; while west of the Rocky Mountains there is a metalliferous area, principally of gold-yielding rocks, 1,300 miles long and from 400 to 500 miles broad. Gold has been found on the west shore of Hudson Bay, silver on the Upper Liard and Peace Rivers, and copper on the Copper Mine River. Iron, graphite, ochre, brick and pottery clays, mica, gypsum, lime, sandstone, and asphaltum are also known to exist in the region. Salt is found in crystals and in saline springs. The evidence submitted to the committee points, in the language of the report, to the existence, in the Athabasca and Mackenzie valleys, of the most extensive petroleum-field in America, if not in the world. The committee suggests that 40,000 square miles of this territory be for the present reserved from sale, as it is probable that in the near future petroleum will rank among the chief assets of the Dominion. The committee bounds the reserved lands as follows: easterly by a line drawn due north from the foot of the Cascade Rapids on Clearwater River to the south shore of Athabasca Lake; northerly by the said lake-shore and the Quatre Fourche and Peace Rivers; westerly by Peace River and a straight line from Peace River landing to the western extremity of Lesser Slave Lake; and southerly by said lake, and the river discharging it, to Athabasca River and Clearwater River as far up as the source.

— The *American Engineer* states that at the foundery and machine-shop of Albert Russell & Sons, Newburyport, Mass., a locomotive engine is being made unlike any before. It is designed to run on the new 'bicycle railway,' which is the invention of Hon. E. Moody Boynton of West Newbury. The tracks are not both laid on the ground, as commonly. One is laid on the ground, and the other is laid on the under side of a framework which is above and directly over the lower track. The engine and cars have wheels on the bottom, and double trucks above. In this way the whole is steadied on the rail, and cannot fall over nor off the track. It is expected that great speed will be attained on account of the comparative lightness of the train, and also because of the loss of friction. The idea is patented in every country in Europe as well as in the United States and other nations of the western hemisphere.

— For many years past the Old Colony Steamboat Company have maintained, at a large expense, an oil lantern on the summit of the beacon on the southern point of Goat Island, Newport. In very bad weather it has been impossible for the man charged with lighting this lamp to effect a landing at this point, and therefore when the light was most needed it was frequently absent. Upon the summit of the beacon there has been placed a duplex socket carrying a 32-candle power lamp, supplied by the Sawyer-Man Company. This socket is so arranged that but one lamp of the pair burns at a time, the second lamp switching in automatically on the failure of the first. A cable one thousand two hundred feet in length is carried to the mainland. The end of this cable is connected with the distributing point of the torpedo station electric-lighting plant. The whole installation was supplied by the Okonite Company, material and work being subjected to the supervision and inspection of the officer commanding the torpedo station, Commander C. F. Goodrich, United States Navy, the Old Colony Steamboat Company paying all the bills. The beacon was first lighted for experiment on Friday night, June 1. This preliminary test proving satisfactory, the operation of the light was definitely installed on Saturday night. The details of the installation are so complete, and the insulation of wires so high, that failure of the lamp, at least for a long time to come, may be considered as a remote contingency.

— The Hydrographic Office has in preparation a report relative to the storm that caused such great damage off the coast about the

middle of March, commonly known ashore as the 'New York blizzard.' Its terrific violence at sea, however, and the wide area which it covered, make it one of the most notable storms of the century in the North Atlantic. Special efforts are being made to collect all the data possible from vessels north of the 20th parallel and west of the 50th meridian at any time from the 11th to the 15th of March, and the co-operation of masters of vessels and foreign hydrographic offices has been earnestly requested. The data at hand are already very complete for the greater portion of the area in question, but additional information is specially desired from vessels about and to the south-eastward of the Bermudas at any time during the dates mentioned above, and, indeed, from vessels anywhere within the limits already stated.

— The logs from the great raft abandoned off the coast of New England a few months ago have drifted in a direction about east by south, and the greater part of them are now in the region between the 33d and 38th parallels and the 30th and 50th meridians. The reports lately received at the Hydrographic Office would seem to show that the general drift of the logs has been about east by south, and that most of them are now west-south-west from the Azores. Very few, if any, have drifted north of the 40th parallel. A great deal of timber has been reported farther north, to the westward of the 20th meridian, but, from the descriptions given, does not seem to be a part of the great raft.

— Dr. David T. Day of the United States Geological Survey has been requested to make a collection of American pottery for the National Museum. The collection of Sevres pottery presented by the French Government is an exceedingly fine one, as is also that of Japanese ceramics; and the department of Indian pottery is not approached elsewhere in the world. But the museum possesses very little modern American pottery, and it is now proposed to fill up this gap.

— The funeral of Prof. Roland D. Irving, late of the United States Geological Survey, took place at Tarrytown, N.Y., Saturday, June 2. Professor Irving, although only forty-one years of age, had long been connected with the survey, and had done a great amount of very valuable geological work. At the time of his death he was engaged in examining the copper-bearing rocks of the Lake Superior region, in regard to which he had published a monograph in 1883. Another monograph by him, on the 'Penokee-Gogebic Iron-Bearing Series,' has been announced. In collaboration with Mr. C. R. van Hise, he has printed a bulletin on 'Secondary Enlargement of Mineral Fragment in Certain Rocks,' and, with Mr. T. C. Chamberlin, 'Observations on the Junction between the Eastern Sandstone and the Keweenaw Series on Keweenaw Point, Lake Superior.' He had also made many contributions to the scientific journals.

— The third number of the *American Journal of Psychology* (Baltimore, Johns Hopkins University) maintains the high expectations of which the preceding numbers gave promise. There are five original memoirs touching upon several of the fields of this rapidly growing science, and the usual number of book-notices and notes. The first article is by Mr. Julius Nelson, and gives an account of his dreams in a manner that gives food for reflection. He has had the patience to record all his dreams for several years, and, as the manner of recording soon becomes regular and constant, the record can be regarded as a relative index of the amount dreamed. This he regards as the important point rather than the particular content of the dream, and his object is to find with what other physiological function this variation in the dream-quantities keeps pace. He finds it in the changes connected with the sexual function, showing a cycle (in both sexes) of a month, with coinciding maxima and minima of intensity. Mr. E. C. Sanford describes some very careful tests of the relative legibility of the small letters of the alphabet, ascertaining the order of legibility both by the distances at which they can be read and by the times it takes to read them, and deducing from his results some important reforms in the shapes of a few of the letters. As a contribution to animal psychology, Mr. Edwards tells of the habits of a colony of crows in their winter roost near Baltimore. The most astonishing point about these roosts is their size, the most modest estimates counting a quarter of a million crows. With surprising regularity they return to the roost at sunset in endless streams, and leave again early in the morning. The value of the article is increased by the full account of the literature of the topic. Dr. William Noyes contributes an interesting description of a case of paranoia expressing itself in connection with a marked artistic talent. About these artistic expressions is clustered a system of symbolism of an elaborated type. The article is well illustrated, and the case described in many respects typical. The final article is by Mr. C. F. Hodge, and gives the results of a very promising series of experiments. A group of ganglion cells were electrically stimulated for several hours, and the changes in the cells under a high power of the microscope looked for. A diminution in the size of the nucleus, measured and tabulated, is the most marked change; and the importance of the observation lies in its opening up a new field of research, from which much can be expected. Prominent among the book-notices are those on hypnotism. No less than forty-four titles occur in this review, and, though this enormous activity includes much that will not stand the test of science, it none the less indicates the scope of the subject and the interest it everywhere arouses. The other departments contain notices of articles bearing on the nervous system, on experimental, abnormal, and anthropological psychology, — all of value to specialists in these fields.

— We learn from *Nature* that some months ago a large consignment of salmon ova was despatched from Denmark to Buenos Ayres, *viâ* Hamburg, for the stocking of certain lakes and rivers in the Argentine Republic. The experiment has proved very successful, the ova arriving in excellent condition, and further consignments are to be made.

— According to *Nature* a marine zoölogical station, on the plan of the one at Naples, is shortly to be established at Ostend. The proposal is supported by four Belgian universities.

— The opening of the Transcaspian Railway to Samarcand recently is an important event in politics and an interesting one in history; but Russian writers have gone a little too far in describing it as a work of great engineering magnitude. On the contrary, with the exception of the bridge over the Oxus, according to *Engineering*, there is not a bit of hard engineering along the whole line. From one end to the other, a distance of over nine hundred miles, it traverses a more or less sandy plain, and possesses fewer engineering features of interest than a thousand other railways elsewhere on the globe. And yet, for all this, while from a technical point of view the Transcaspian Railway is a mere trifle, the undertaking, in regard to its audacious conception and successful accomplishment, must long remain a credit to Russian engineering. Eight years ago any one who would have prophesied that in the present year of grace trains would be running to Samarcand would have been considered fit for Bedlam. Universal ridicule was poured by the Russian press upon General Annenkoff when he first broached his scheme, and the English press was scarcely less complimentary to Mr. Charles Marvin when he published an account of it in his pamphlet, 'The Russian Railway to Herat and India.'

— According to *Engineering*, the Russian Government has already commenced the cutting of the Perekop Canal. This great work is intended to provide communication between the Sea of Azov and Odessa without circumnavigating the Crimea. It will be 111 versts, or 74 miles, long, and take about four and a half years to construct; its completion being timed for the autumn of 1891. When finished it will prove of considerable strategical and commercial importance. By means of it men-of-war will be able to proceed from Odessa or Otchakoff to the Sea of Azov without exposing themselves to capture in passing round the Crimean Peninsula, and a short cut will be provided for the transport of coal from the Azov port of Mariopol to the Black Sea ports of Odessa, Kherson, and Otchakoff. Both during the Crimean and the last Turkish war the Russians felt the need of rapid intercourse between the interior of Russia and the ports of the Black Sea. The new canal will enable them to concentrate their Don, Volga, and Azov resources with great facility at the Odessa extremity of the Czar's dominions, and will naturally render them more powerful in controlling the mouth of the Danube. In time of peace the canal

will be of great service in allowing barges to proceed from the Don to Odessa, which at the present moment is impossible, and it is believed that there will be no difficulty in doing this even at periods when the storms that rage in the Black Sea stop coast navigation. The commencement of the canal took place without any fuss, all festivities being reserved for its completion. No engineering difficulties whatever exist.

— The average tonnage of ships passing through the Suez Canal has increased from 1,000 tons in 1871, to over 1,750 in 1887. Out of 3,137 vessels passing through last year, 2,230 were English, and only 3 American. *The Engineer* well says, "This table also indicates the depth to which the once great merchant navy of the United States has sunk, to find that only three voyages were made in the year by its ships through this great water-way."

— The annual reception of the microscopical section of the Brooklyn Microscopical Society was held June 5.

— At the last meeting of the New York Academy of Sciences, Mr. George F. Kunz exhibited some of the finest red corundum (ruby) from within twenty miles of Atlanta, Ga. This was in pieces weighing one pound, and was part of a mass weighing 350 pounds which was found on the surface. He also exhibited gold quartz from Dutch Guiana (gold formerly found there only in placer deposits had been traced to the vein by a brother of the United States consul, Mr. Thomas Brown), and exhibited specimens said to have assayed $450 to the ton. The mines are situated four miles from Paramaribo; and the ore is sent to the coast by natives, who carry it on their heads in fifty-pound bags, making two trips a day. He also read a paper entitled 'List of Diamonds found in the United States,' which will be published later on by the society, and stated, that, in addition to the diamond weighing four and a third carats, exhibited by him two months ago, and reported as having been found near Morrow Station, thirteen miles south of Atlanta, Ga., he had recently heard of a two-carat stone which was brought to Mr. L. O. Stevens of Atlanta, Ga., by a colored man, who found it in his garden a few miles from the city, but who would not sell it, or allow it to be sent North. It was imperfect and off-colored. Mr. Kunz also said that five years ago he had identified topaz, for the first time in Maine, at Stoneham; and ever since then he had been on the lookout for the rare gem phenacite, crystals of which he had the pleasure of showing on that evening. This was the first time it had ever been found in the United States outside of Colorado, where it was first discovered in 1882. In Maine a number of superb light-green and sherry-colored topaz crystals were found. They were several inches in length, but of little gem-value.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

An Unusual Auroral Bow.

THE description of the aurora of the night of May 20, by Mr. Kellicott of Buffalo, in *Science* of June 1, is so remarkably similar to the phenomenon as it appeared here, that it seems worthy of mention. Besides "the long streamers emanating from a bright, irregular arch resting on dark clouds," there appeared that extra arch, about the apparent width of a rainbow, with its extremities resting on the eastern and western horizons, and its top passing near the zenith. This arch was first noticed here at 9.30 P.M. standard time, and was very bright at that time, but without color. After 9.35 P.M. it began to grow fainter, but was still faintly visible at 10 P.M. A phenomenon visible here which was not mentioned by Mr. Kellicott was the appearance of a segment of a secondary arch or band attached to the top of the main arch in the north, and at 9.30 P.M. extending down to the horizon a little west of north. Between 9.35 P.M. and 9.40 P.M. the lower end of this segment seemed to detach itself from the earth, and, pulsating like a piece of ribbon held by one hand and waving in the wind, it rose upward, at the same time exhibiting beautiful colors, and at 9.40 to 9.42 P.M. joined the main arch, which assumed the appearance of a bent bow. The main arch retained this appearance for nearly a half-hour, but slowly assumed the appearance of the normal auroral bow without streamers. The times and appearances given above were taken from notes made at the time of the aurora.

H. HELM CLAYTON.

Blue Hill Observatory, June 5.

The People and the Common Schools.

HOW natural it is for us to try to shift responsibility from our own shoulders upon some other fellow's back! and yet, as Lester Wallack used to say in 'Ours,' "there is nothing so consoling to a man, when he is found out, as the sweet consciousness of — guilt."

The people are at last becoming conscious that there is something wrong in the great public-school system of New York City, — a fact that has been evident to every true educator in the land for the past ten years; and now the people dearly desire to make somebody a scapegoat for their sins. After stoning the scapegoat out of camp and into the wilderness, they would like to again relapse into a complacent contemplation of their own righteousness, soothed by a serene sense of duty well done.

They can safely enjoy "the sweet consciousness of guilt," however. The schools are to-day just what the people, through apathy, indifference, carelessness, and ignorance, have permitted them to become, — one vast machine; a treadmill, teachers treading the wheel, happy innocent children the grist, superintendents for task-masters, and the product a mass of automatons.

Have you not committed the monumental stupidity of placing, through laws enacted by your servants, all responsibility for the management of your schools — not only in monetary matters, but in all educational affairs as well — into the hands of bankers, brokers, lawyers, and physicians, who know no more about the science of education than school-teachers do about finance, law, and medicine, and perhaps not half as much?

To show the utter absurdity of this condition of affairs, it is only necessary to suggest that the Chamber of Commerce, the Stock Exchange, the Bar Association, and the County Medical Society select their governing committees from among the principals of the New York schools. Preposterous, is it? Would it not be safer to intrust affairs of finance to a man who knows, in theory at least, all the laws that govern trade — as a principal must — than to intrust the education of one hundred and fifty thousand children to men who know nothing of the science of pedagogy even in theory?

It is of no use to try to dodge the issue by stating that the Board of Education is guided in educational matters by the city superintendent, an expert teacher. Neither he nor the Board of Education will permit any such construction of the law defining their relative positions. The city superintendent pleads that he is only responsible for the execution of the law as it stands. The Board of Education assumes all responsibility for the inception, enactment, and continuance of all the laws, other than 'State Statutes,' which he executes.

The city superintendent is thus the self-confessed creature of the system he administers, instead of being, as you perhaps supposed, in any degree its creator. If he is not even the author of any portion of the present system, of which he has been the executive head for the past nine years, how can he be expected to become the creator of a nobler plan for the education of your children? You certainly cannot indulge in any such unreasonable expectation.

You, the people of New York City, are directly responsible for the larger part of all the evils that exist in the common-school system. Your children attend them; you hear from them daily reports of the manner in which they are educationally crammed; you see them at home, wearing out their young lives in preparing lessons for the next day's recitations; and, if some wise teacher reduces the tasks assigned for home-study, you immediately begin to inquire why your children have no more books, and why they have so few lessons to learn at home.

I know you do this, for I have heard you talk just that way. In vain have I pleaded with you for the little ones. In vain have I told you that five hours' daily attention to books, to recitations, to instruction, is all that any growing child can safely endure. "No, no!" you cry, "give them more lessons — give them tasks to do at home;" and your children go through their school-lives with the

shadow of the coming task always falling upon the task just finished. The gentle, obedient, loving, and affectionate little ones suffer; while the dear bad boys won't even make an effort, and thrive accordingly. The teacher can sometimes go home with his work finished for the day; the pupil never.

Now, if I will not permit this wrong to be perpetrated in the school under my charge, you take your boy away and send him to Mr. Examination Hunter's school; and you take your girl out of Miss Honest's department and send her down to Miss Show-off's school; and then you point with parental pride to the great load of books your little ones stagger under, as a proof of the superior efficiency of those two principals "whom we all respect." Then, when your little girl graduates, and Miss Show-off orders all the graduates to wear white dresses and tea-roses, and to come in carriages, and to drape their desks in white, you all say, "She has no right to give any such orders, and it ought to be stopped, and" — You get the dresses and the tea-roses and the carriage, and you attend the reception; and it is all so beautiful, and the members of the mutual admiration society do speak so mellifluently, — buttered honey, as it were, — that you are as proud of your daughter as a drum-major on parade. And then you go home, and your daughter has typhoid-fever, or spinal meningitis, or some other Latin disease, and you lay the blame on Providence. Who is to blame if the supply of sham education be exactly proportioned to your demand for it?

If you could only once be roused from your apathy on this subject, do you not know that your servants — the mayor, the Board of Education, and the Legislature of this great State of New York — would skip around like waiters in a dime restaurant to get you what you want?

The press has at last taken hold of this matter for you. How many of you will read what is written in your interest, and how many more will skip it all in order to read about the latest base-ball match or the last prize-fight? If you, happily, by any chance, have read thus far without throwing down the paper, will you kindly read the summing-up of the whole matter? The public schools of New York City will never be any better than the people of that city demand that they shall be.

EDWARD H. BOYER,
Principal Grammar School 9.

Reflex Speech.

NOTING the paragraph in *Science* of May 25, quoting from the *Journal of Mental Science* a statement of experiments in reflex speech, it seemed to me that certain experiences of my own in reflex writing might be of interest. I compose and write with considerable rapidity, and, on re-reading my manuscript, often find that my hand has written words in opposition to the orders from my mind. Of the several words beginning with *th*, for instance, 'the' is often written where 'they,' 'this,' or some other word, was intended. In like manner 'their' becomes 'there;' 'whether' takes the form of 'where;' 'while' replaces 'which,' 'what,' etc.; and other vagaries of the same general character now and then appear. Probably experiences of this kind are common, and are passed over without reflection as to their cause. They have long seemed to me evidences of reflex action. In rapid composition, the writing hand lags behind the conscious thought, which springs on to the words in advance, and leaves its successive orders to be executed in an automatic and unconscious fashion.

Ordinarily the wheels of the brain roll on in due order; but occasionally the hand seems to take the task of suggestion on itself, taking advantage of the absence of consciousness, and moving in a more customary channel than that directed: *th*, for instance, is followed by *e* more commonly than by any other letters; and the hand, if left to the action of reflex suggestion, would write 'the' in preference to the other *th* words. It is not at all surprising, then, that the writing of *th* sends back a reflex suggestion of *e* as the concluding letter of the word, which is occasionally of sufficient strength to overcome the impulse given by consciousness to the brain to write some other word.

It may be, however, that this phenomenon is due to relations of the nervous system different from those ordinarily estimated, and that the brain has nothing to do with the dereliction of duty in the hand. I should suggest the following theory in explanation of the phenomenon. The brain does not differ in physical formation from the inferior ganglia, and may not differ in its power of memory-recording. The impulses which pass along the sensory nerves to the brain traverse several ganglia on their way thither, and may leave memory traces in each of these as well as in the brain. The impulses to motion emanating from the brain similarly pass through inferior ganglia, and may produce in them conditions similar to those affecting the brain at that instant. But when the consciousness has brought the brain into condition to produce certain successive effects, this condition does not exist in the inferior ganglia. In writing the letters *th*, for instance, two influences are at work. There are influences descending from the brain to produce certain succeeding motions in the fingers; and there are sensory influences flowing upward from the moving fingers which are full of reflex suggestiveness. It seems not improbable, then, that this reflex suggestion may now and then call forth a response from an inferior ganglion, and thus check the action of the brain, which, in its unconscious automatism, may need a reflex influence from the fingers to bring it into condition to complete the word.

If such be the case, we can readily understand why the more ordinary words beginning with certain letters are occasionally written, instead of those dictated by consciousness, which begin with the same letters. It may perhaps be that the work in both cases is done by the brain, and yet this hardly seems probable: for the brain is put in train to perform a certain duty, and its tendency to do this seems likely to be stronger than any reverse tendency to perform a more customary action. This reverse tendency may undoubtedly occasionally gain precedence; but, if the inferior ganglia have the capabilities above suggested, it is not improbable that the reversing influence comes from them, and that the precedence which the brain possesses while in conscious activity may weaken during unconsciousness, so that, if the reflex influence from the hand arouses all the ganglia through which it passes to activity, an inferior ganglion may occasionally win in the conflict with the brain, and take control of the reins of action. C. MORRIS.

Philadelphia, Penn., June 5.

Answers.

32. HUMAN BEINGS AS PACK-ANIMALS. — Prof. Joseph LeConte of the University of California sends the following information in reply to an inquiry in *Science* in reference to the strength and endurance of the human pack-animal. I shall be extremely obliged for many notes of this kind from every part of the world. "In 1844 I travelled by birch-bark canoe something like a thousand miles, from Lapoint over to the head waters of the Mississippi, and down the latter to Fort Snelling, at mouth of Minnesota River. We made several portages, the longest being nine miles. We had along two trunks, and provisions and bedding for four persons for one month. The load which our two *voyageurs* carried was certainly one hundred and fifty to two hundred pounds each. They made seven miles in one day, going over the ground five times; i.e., thirty-five miles. Three fifths of the distance they were loaded, and two fifths going back for another load. Their plan was to take the heaviest load first (about two hundred pounds), and carry it about a mile or a mile and a half, put it down, go back for another load of one hundred and fifty pounds, carry this a mile or a mile and a half beyond the first deposit, then come back, take up the first deposit and carry it the same distance beyond, etc., until all was carried to the camp for the night; then, last of all, they went back seven miles to the last camp, took up the boat (which was the lightest load of all), and carried it to camp. I will give an account of one load. They used a leather strap about two inches and a half wide in middle, and slenderer towards the end, and perhaps ten or twelve feet long. One fellow, a famous *voyageur*, would tie this about my trunk (about seventy-five pounds) in two places near each end, and throw it over the head, bringing the band across the forehead, the trunk resting on the back, then take a hundred pounds of flour and put on the trunk, and then twenty-five pounds of crackers on top of all, and walk off briskly, almost in a trot. The man was not a large or very muscular man, but rather lean and wiry."

O. T. MASON.

Washington, D.C., June 5.